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on March 18, 2004

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Applicant:	Dyks et al.
Serial No.:	10/643,244
Filed:	August 18, 2003
For:	PROCESS FOR THE MANUFACTURING OF FROZEN AERATED PRODUCTS

Edgewater, New Jersey 07020
March 18, 2004

SUBMISSION OF PRIORITY DOCUMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to rule 55(b) of the Rules of Practice in Patent Cases, Applicant(s) is/are submitting herewith a certified copy of the European Application No. 02255801.9 filed August 20, 2002, upon which the claim for priority under 35 U.S.C. § 119 was made in the United States.

It is respectfully requested that the priority document be made part of the file history.

Respectfully submitted,

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Attestation

Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. **Patent application No.** **Demande de brevet n°**

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Process for the manufacturing of frozen aerated products

In Anspruch genommene Priorität(en) / Priority(ies) claimed /Priorité(s) revendiquée(s)
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PROCESS FOR THE MANUFACTURING OF FROZEN AERATED PRODUCTS

Field of the invention

The present invention relates to a process for the manufacturing of frozen aerated products. The present invention more particularly relates to the manufacturing of shaped products such as ice cream balls and the like.

Background of the invention

Manufacturing chocolate balls has been known for decades and various technologies based on cylindrical rollers have been proposed such as the one described in EP923875 which describes a pair of parallel rollers having cavities defined on the outer cylindrical surfaces, a depositing device depositing a solidifiable liquid such as chocolate onto said cylindrical surfaces, thus providing two separate parts of food articles. By counter rotating the rollers, the two surfaces move towards one another and join the two separate parts into one food product. The whole process is based on the fact each individual food article is linked to the others by a film, or a web, made out of the same food material. It is also relying on the fact that, on cooling, chocolate contracts and readily de-moulds from the cavities.

Whereas this process is adequate for manufacturing chocolate balls from a liquid base, it is totally inappropriate for the manufacturing of ice cream products wherein the cavities would be filled by a frozen aerated product. The main obstacles against transferring this technology to ice cream products are that the cavities must be at a temperature low enough, otherwise the ice cream fed into these cavities will melt (at least at the surface), but if the cavities are below 0 C, then the ice cream will stick to the surface and will not be easily 'de-mouldable'.

Such problems are for example illustrated in JP62-91148 which attempts to propose a process for the manufacturing of ice balls while addressing the problem of ice sticking to the walls of the cavities and which can be described as follows. When the corresponding cavities of the pair of rollers pass the point where they are the closest to one another, the frozen product in each cavity is not pressed hard enough against the contiguous product situated into the corresponding cavity on the other roller, when the cavities move again away from each other through the rotation of the rollers, the force linking the two half products is too weak in comparison with the adhesion between each half product and the cavity in which it is and thus it stays in the cavity and does not 'de-mould'. JP62-91148 addresses this problem by i) heating one of the roller with an internal circulation of hot liquid, and ii) by providing ejection mechanisms in each cavity of the other roller. These ejection mechanisms allow for the two half products to be pressed together while heating one roller allows for demoulding the product.

This technology does not constitute a practical solution for the problem raised by attempting to produce frozen aerated products using a pair rollers since the need to effectively melt the surface of each product to allow for its de-moulding raises unacceptable hygiene issues. In other respect, the ejection mechanisms situated in each and every cavity of a roller are extremely complex, difficult to maintain, and again constitute a hygiene hazard.

It has now been found that, by taking benefit from the characteristics of some ice cream products which, at first sight, seem to constitute other impediments against the use of the roller technology to mould ice cream products, it is possible to produce ice cream balls in a simple, hygienic and efficient way.

Tests and definitions

Frozen aerated product shall mean a frozen confection as described in ICE CREAM - Fourth Edition - W S Arbuckle - Chapman & Hall - pages 297 to 312.

Temperature of the rollers:

The roller temperature is measured by a probe situated 5 mm beneath the surface

Brief description of the invention

It is the object of the present invention to provide a process for the manufacturing of frozen aerated products comprising;

- providing two separate forming elements,
- providing at least one open cavity on a surface each forming element,
- providing filling devices for filling said cavities with a frozen aerated material,
- filling two cavities, one on each moulding surface, with a frozen aerated material,

wherein

- at least one of the cavities is filled with a frozen aerated product having an overrun of between 30% and 130% ,
- this product is then allowed to expand outside its cavity,
- the two cavities are then moved opposite one another and the frozen aerated product in each cavity is pressed against the frozen aerated product in the other cavity.

Preferably the temperature of the forming elements are cooled with liquid nitrogen and are at a temperature below -80°C, more preferably below -100°C.

Preferably, the frozen aerated product is at a temperature of between -3°C and -20°C , preferably between -5°C and -15°C, even more preferably between -7 and -11°C when filled into the cavities.

More preferably, the two separate forming elements are a pair of parallel rollers wherein each roller has a multiplicity of open cavities on its surface, the rollers counter-rotating so that respective cavities in the two forming elements lie opposite one another and the frozen aerated product in a cavity of a first roller is pressed against the frozen aerated product in an opposite cavity of a second roller.

Whereas the two rollers can operate at a constant rotational speed, it has been found surprisingly advantageous to operate at variable rotational speed. It has particularly been noticed that the filling of the cavities is greatly improved if a roller stops, or at least significantly slows down, while a cavity is filled in. Therefore, the two rollers operate at a variable rotational speed. Preferably the rotational speed of a roller is at its minimal value when a filling device is over a cavity of this roller and at a maximal value when a filling device is between two cavities. More preferably, a roller is brought to stop when a filling device is over a cavity.

Detailed description of the invention

The present invention will be further described with reference to the sole accompanying drawing which represents a schematic view of an apparatus for carrying out the process according to the present invention.

As disclosed in the accompanying drawing, the apparatus comprises a pair of parallel rollers having cavities defined on their outer cylindrical surfaces. A first filling device is provided for

supplying frozen aerated product into the cavities of the first roller. A second filling device is provided for supplying frozen aerated product into the cavities of the second roller. Motor means, not shown, are arranged for counter rotating the two rollers, to move the two surfaces towards one another and to press the frozen aerated product in a cavity of the first roller against the frozen aerated product situated in a cavity of the second roller.

The two rollers which are adapted to counter-rotate, are positioned to touch each other. By 'touching each other', it is meant a clearance of less than 0.1mm. The rollers must be refrigerated by circulating an appropriate refrigerating fluid, such as liquid nitrogen, in order to have, in operation, a temperature of below 100°C, as measured by an internal probe 5mm beneath the surface.

Each of the two filling devices advantageously comprises a manifold mounted in the close proximity to the roller cylindrical surface, with a clearance, in operation of below 1mm.

The two rollers can be made for example of aluminium or steel and the surface can be treated with a coating to improve hardness (e.g. chromium coating) or to improve mould release (e.g. PTFE). The cavities shapes follow the normal rules for demouldability.

Examples

During this trial, the unit was equipped with two stainless steel rollers. The rollers had 3 lanes of ball (28mm diameter) cavities arranged in a line across the width of the roller (96 balls per roller).

Liquid nitrogen was fed to the rollers. The initial temperature of the rollers during the trials was -140°C.

Four different runs took place to determine the effect that the rotational speed of the roller has on product quality and release characteristics.

Examples A:

Roller Speed = 1rpm = 96 products per min
Rollers temperature actual range - 139 to -151°C
Rollers Motion:
Acceleration = 500ms, Deceleration = 500ms, Pause Time = 1085ms.

Frozen aerated product - Standard aerated ice cream mix. Flowrate = 50kg/hr Overrun = 60%. Extrusion Temperature = -7.9c.

Samples for Quality Analysis were collected about 20 minutes after start up. Visual examination showed the products to be of good quality.

A large hard shell was seen on ALL products.

Over a 5 minute period, 8 halves (4 balls) were recorded, meaning a 0.8% defect rate.

Example B:

Roller Speed = 1.25rpm = 120 products per min
Roller temperature actual range - 138 to -140°C
Roller Motion :
Acceleration = 500ms, Deceleration = 500ms, Pause Time = 665ms.

Frozen aerated product - Standard aerated ice cream mix. Flowrate = 59kg/hr Overrun = 60%. Extrusion Temperature = -7.9c.

Samples for Quality Analysis were collected about 10 minutes after stable conditions were obtained. Visual examination showed the products to be of good. The product quality appeared to be similar to those produced in Example A.

The thickness of the shell was reduced compared to the products in Example A.

Over a 5 minute period, 4 halves (2 balls) were recorded = 0.3% defect rate.

Example C:

Roller Speed = 1.8rpm = 174 products per min
Roller temperature_actual range - 130 to -138C
Roller motion
Acceleration = 500ms, Deceleration = 500ms, Pause Time = 165ms.

Frozen aerated product - Standard aerated ice cream mix. Flowrate = 93kg/hr Overrun = 60%. Extrusion Temperature = -7.9c.

Samples for Quality Analysis were collected about 10 minutes after stable conditions were obtained. Visual examination showed the products to be of good quality. The product quality appeared to be similar to those produced in Run (A) and (B).

The thickness of the shell was reduced compared to the products in Examples A and B.

Over a 5 minute period, 2 halves (1 balls) were recorded = 0.1% defect rate.

To summarise, good quality products were produced over the range of 96 - 174 products per min using the stainless steel rollers. Low numbers of halves (0.1% - 0.8% defect rate) were produced throughout the trial. The temperature of the rollers becomes easier to control at higher rotational speeds. The extent of the temperature gradient across the roller reduced with increasing rotational speed.

Claims

1. Process for the manufacturing of frozen aerated products comprising;
   - providing two separate forming elements,
   - providing at least one open cavity on a surface each forming element,
   - providing filling devices for filling said cavities with a frozen aerated material,
   - filling two cavities, one on each moulding surface, with a frozen aerated material,

   wherein
   - at least one of the cavities is filled with a frozen aerated product having an overrun of between 30% and 120%,
   - this product is then allowed to expand outside its cavity,
   - the two cavities are then moved opposite one another and the frozen aerated product in each cavity is pressed against the frozen aerated product in the other cavity.

2. Process according to claim 1 wherein the frozen aerated product is at a temperature of between -3°C and - 20°C, preferably between -5°C and -15°C, even more preferably between -7 and - 11°C, when filled unto the cavities.

3. Process according to claim 2 wherein the two separate forming elements are a pair of parallel rollers wherein each roller has a multiplicity of open cavities on its surface, the rollers counter-rotating so that respective cavities in the two forming elements lie opposite one another and the frozen aerated product in a cavity of a first roller is pressed against the frozen aerated product in an opposite cavity of a second roller.

4. Process according to claim 3 wherein the rollers counter rotate at a variable rational speed.

5. Process according to claim 4 wherein the rotational speed of a roller is at its minimal value when a filling device is over a cavity of this roller and at a maximal value when a filling device is between two cavities.

6. Process according to claim 5 wherein a roller is brought to stop when a filling device is over a cavity.

Abstract

Frozen aerated products are produced by i) providing two separate forming elements, ii) providing at least one open cavity on a surface each forming element, iii) providing filling devices for filling said cavities with a frozen aerated material, iv) filling two cavities, one on each moulding surface, with a frozen aerated material, wherein at least one of the cavities is filled with a frozen aerated product having an overrun of between 30% and 120% , this product is then allowed to expand outside its cavity, the two cavities are then moved opposite one another and the frozen aerated product in each cavity is pressed against the frozen aerated product in the other cavity.